6.3. Indicators and modelling approaches
7.24. Resource efficiency: What are we measuring?

Structuring the EU's resource efficiency data base. A policy driven indicator approach.

Summary

EU resource efficiency policy documents include a multitude of data and indicators that support the need for such policies and point to the benefits for businesses, consumers and the environment. Based on an analysis of EU policy documents with respect to data, indicators and potentially measurable concepts, this paper identifies the policy demand for indicators and proposes an innovative comprehensive overall framework to organise the 'numerical knowledge' on EU resource efficiency policies. The main framework suggested and tested follows the steps of the economic production chain from the availability of natural resources, to extraction, industry input, efficiency of production and consumption, circular economy and environmental impacts. To cope with the heterogeneity of data, principles for sub-structuring are suggested. By using the suggested framework stakeholders of resource efficiency policies could work together more constructively and effectively to make the wealth of available data accessible for public and private decision support.

Extended abstract

Measuring resource efficiency with statistical data and indicators is more complex than measuring labour or energy productivity. However, it is likely to become as important for a nation's prosperity. To paint a complete picture indicators on resource efficiency need to cover as divers issues as the scarcity of natural resources, waste recycling rates and generated secondary raw materials, prices of and revenues from raw materials, the environmental and biodiversity impacts of material use in different sectors and products within countries and worldwide - always keeping both a production and a consumption perspective.

Information and data on resources and their processing are scattered over a wide range of sources such as official statistics and accounts, official environmental reporting, space agencies, natural science publications and economic databases, environmental NGOs, companies and business organisations. All these data sources would need to contribute their part to provide a coherent 'numerical' picture of resource use and its efficiency. This picture needs to emerge on various levels including industries, materials, products, capital stocks, eco-systems and countries to inform the respective decision makers. In addition to the detailed picture highly aggregated macro-indicators could be useful to allow for an integrated assessment of overall progress.

As resource efficiency is a policy approach that intends to reconcile environmental and economic interests the indicator set needs to reflect consistently these different perspectives. A first conclusion from this is to include systematically monetary indicators next to physical ones.

The approach of the presented research is policy driven. It uses the EU as a case study as it has a resource efficiency policy in place since 2010, which was further elaborated ever since. The EU's policy is laid down by four strategy documents: the "Europe 2020 Strategy on smart, sustainable and inclusive growth", the "Flagship Communication" and the "Resource Efficiency Road Map" and the recent "Circular Economy Package". These policy documents have been analysed for its measurable content, i.e. quoted data and indicators but also information that could usefully be captured in numerical terms. To cover a more political

angle also key speeches on resource efficiency have been analysed. Thereby, the policy demand for data and indicators was identified.

As expected, the identified measurable concepts have a high degree of heterogeneity. This paper proposes to structure data along the production chain. One key advantage of this framework is that it connects well to both, the economic and the environmental perspective. In addition, also data production and research is frequently oriented to the steps in the production chain.

The following steps have been identified to structure data along the production chain as the overall framework: 1. abundance/scarcity of natural resource sources; 2. resource extraction/harvest; 3. resource input for industry; 4. resource efficiency of processes and products; 5. circular economy; 6. environmental impacts.

Furthermore, the policy analysis revealed that the following distinctions are relevant to policy makers and therefore provide for a useful sub-structure next to the overall framework steps:

- the level and the efficiency of resource use, and the policy measures to influence them;
- flows and stocks of natural resources and the natural capital providing them;
- the territory vs. the life cycle perspective;
- production vs. consumption focus;
- bio-physical vs. monetary data;
- renewing, renewable and non-renewable resources.

In the following, the six framework steps are further developed using the above mentioned distinctions to structure them, as appropriate.

1. On the abundance or scarcity of natural resource sources, the key distinction is between non-renewable, renewing and renewable resources, where the sink capacity is considered mainly a renewable resource. Domestic versus foreign resources is a way of discussing the availability of scare resources under the label resource dependency. Policy makers are well aware that resource availability changes with technologies, prices, geo-political constellations as well as seasons, nature protection assignments and source management. Therefore it is recognised that such figures are rarely accurate and can change quickly. Nevertheless the available resources are partly monetised, e.g. if part of the balance sheet of a company.

2. On the natural resources extracted or harvested the focus is on 'net' extraction, meaning the part of the extracted material is actually moved out of the extraction site. Mining tailings and by-catch of fisheries are examples for extracted material remaining on site. The share of net extraction in 'gross' extraction is an indicator of extraction efficiency. Sustainable use, e.g. expressed as respecting the maximum sustainable yield, is a key concept to express the ecological aspect of resource efficiency for renewables. As e.g. extracted resources maybe further processed by the same company, the monetary value of extracted resources is not available throughout.

3. The raw material input to manufacturing industries is in focus of the economic or business approach to resource efficiency. It can be expressed in physical as well as in monetary terms. The efficiency of this step is *inter alia* related to losses during transport and storage, e.g. leaking pipelines or crops rotting in warehouses.

4. There is a strong desire for indicators that would indicate the overall resource efficiency of production or products. However, the examples used in policy documents frequently relate to technological efficiency gains in areas like heating and transport as different technologies are easy to compare due to the uniform services they provide. As several EU policies aim at improving such technological efficiencies, under this topic policy response indicators are

important. There is clear recognition that production and use phase efficiency are to be measured separately, while policies should address both phases in an integrated way.

5. On the topic of redesigning the production chain towards a circular economy, recycling rates and derived secondary raw materials are at the centre. Recycling rates are relevant for both raw materials and products. Efficiency indicators of this step are the amount of secondary raw materials produced divided by either the wastes collected for recycling or the total amount of waste generated. Measuring the potential for recycling based on the construction of products and the design of infrastructure are a mentioned challenge.

6. Environmental impact indicators can be calculated for each of the steps in the production chain. On the other hand they are seen as an overall topic in themselves. And from the ecological perspective the final aim of resource efficiency policies is reducing negative environmental impacts down to at least a sustainable level. Only implicitly the policy documents mention the negative feedback environmental impacts caused by resource use can have on the availability of the same or other natural resources.

Despite the recognition of the importance of the above mentioned data and their frequent use in policy documents and political declarations, there is no systematic effort to make those figures accessible from one single portal. Based on the proposed framework the various resource efficiency stakeholders could better work together to make the data more freely available and collaborate to producing the missing data – for the benefit of both public and private decision making.